Bill Wilson Expert Report

Attachment 10

Biodiversity Conservation Conservation Alliance & Sierra Club v.
Mountain Cement Co., Case No. 04CV 361-B
June 13, 2005

Colorado Department of Public Health and Environment

OPERATING PERMIT

CEMEX, Inc.
Lyons Cement Plant

ISSUED FEBRUARY 1, 2000
Last Revised: October 8, 2002

			S010 - Raw Material Grinding	3 TPH Iron Ore		
			S011 - Separator	15 TPH Silica 150 TPH Raw Meal Product		Grandfather
Homogenizing & Blending	P006	006	S014 - Homogenizing Silo	180 TPH Raw Meal	Baghouse (2 each)	Grandfather
			S015 - Kiln Feed Silo			Grandfather
Kiln Burning	P007	007	S016 - Precalciner Kiln	120 TPH (dry)	Baghouse	12BO444-2
Clinker Cooling	P008	008	S018 - Clinker Cooler	81 TPH	Baghouse (3 each)	
Clinker/Gypsum Silos and Weigh Feeders	P009	009 010	S026 to S035; S021 & S051 - Weight Feed Conveyors	600,000 tons/year (3) Silos, 800 tons each	Baghouse (12 each)	8BO0259
			S039 to S041 - Clinker & Gypsum/Additive Storage Silos and Weigh Feeders	(2) 105 tons/hour weight-o-meters (1) 5 tons/hour weight-o-meter		
Sheltered (A-Frame) Clinker Storage and Reclaim	P010	010	Reclaim to clinker storage silos	600,000 tons/year Maximum A-Frame capacity - 60,000 tons		
			S017 - Clinker Drop			
			S023 - Transfer			
			S024A - A- Frame Building			
Outdoor Clinker Storage and Handling	P010A	030	Outdoor Clinker Storage Pile	120,000 tons storage	Emission Control Plan	8BO0259
Finish Mill Grinding	P011	011	Cement Finish Mill and Bucket Elevator/Auxiliaries S036 & S037 - Grinding	600,000 tons/year	Baghouse (6 each)	
	P012	031	S065 - Separator	Separator - 150 tons/hour fines produced		
Cement Silos/Packhouse /Loadout	P013	012 013	Cement Loadout Spouts S043 to S048 - Cement Silos S049 & S050 - Packhouse	(19) Silos, 34,330 tons total capacity	Baghouse (6 each)	
Clinker & Fuel Handling System	P014		S020 - Coal Silo S025 - Coal/Clinker Hopper	200 TPH Coal and Clinker		C-10,316
Haul Roads	P016		Haul roads			None
Fuel Storage Tank	T001		Fuel Storage Tank Breathing/Working Losses	8,000 gallons		None
Pneumatic Conveyance of Materials	P007A	040	040A - Conveyance of Cement Kiln Dust (CKD) to Silo No. A5 or Silo No. 2844		Bagfilters	98BO0315
			040B - Conveyance of Benefication Dust to Silo No. 2844		Bagfilters	

STATEMENT OF BASIS

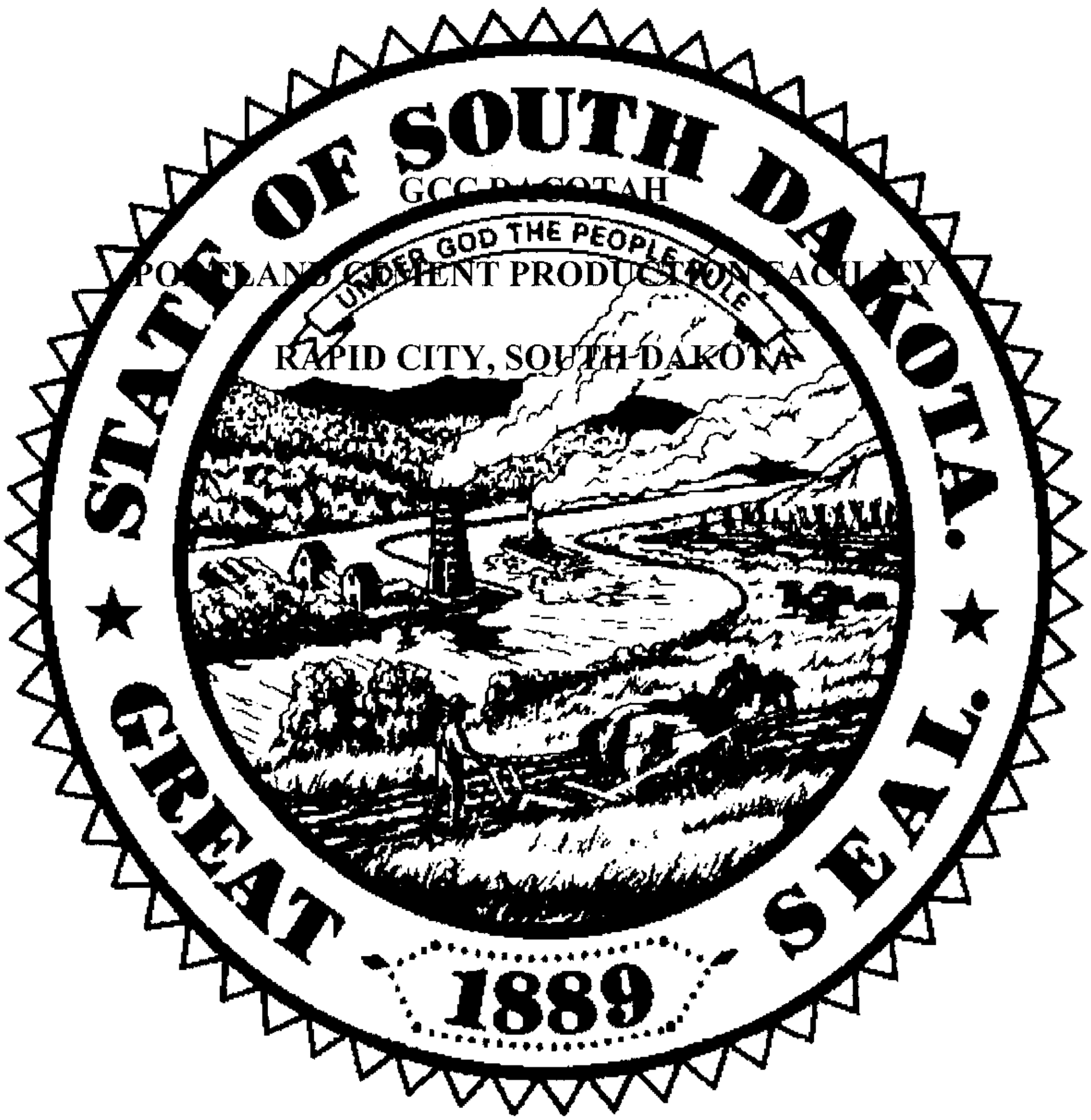
PREVENTION OF SIGNIFICANT DETERIORATION

PRECONSTRUCTION PERMIT

GCC DACOTAH

PORTLAND CEMENT PRODUCTION FACILITY

RAPID CITY, SOUTH DAKOTA



SOUTH DAKOTA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

Table #1
Description of Units, Operations, and Processes Impacted by Kiln #6 Upgrade

Unit		Description of Process	Maximum Operating Rate	Control Device		
				Description	Status	Permitted
1	**EDC101**	Primary and secondary crushers	1,000 tons per hour	Baghouse	Existing	Permitted
2	**EDC102**	Screen	1,000 tons per hour	Baghouse	Existing	Permitted
9	**EDC619**	Loesche mill and rotary kiln #6	2,250 tons clinker per day	Preheater, Precalcinator, and Baghouse	Existing	Permitted
6	**EDC652**	Raw material storage building to two kiln feed storage silos	180 tons per hour	Baghouse	Existing	Permitted
6a	**EDC501**	Rock silo to Loesche mill	180 tons per hour	Baghouse	Existing	Not Permitted
6b	**EDC602**	Kiln feed storage silo to kiln #6	160 tons per hour	Baghouse	Existing	Not Permitted
7b	**EDC710**	Clinker shed to finish mills	500 tons per hour	Baghouse	Existing	Not Permitted
7c	**EDC706**	Raw shed to Loesche mill	40 tons per hour	2001 Fuller baghouse	Proposed	Not Permitted
7d	**EDC701**	Raw material transferred from belt conveyor 107 to belt conveyor 108	800 tons per hour	2001 Fuller baghouse	Proposed	Not Permitted
10	**EDC615**	Dry process clinker cooler	2,250 tons clinker per day	Baghouse	Existing	Permitted
7e	**EDC705**	Gypsum raw shed to old clinker building	350 tons per hour	2001 Fuller baghouse	Proposed	Not Permitted
7f	**EDC703**	Raw shed to Loesche mill	40 tons per hour	2001 Fuller baghouse	Proposed	Not Permitted
7g	**EDC704**	Gypsum raw shed to old clinker building	350 tons per hour	2001 Fuller baghouse	Proposed	Not Permitted
8	**EDC614**	Penthouse storage #2 (north)	2,250 tons clinker per day	Baghouse	Existing	Permitted
8a	**EDC627**	Penthouse storage #2 (north)	2,250 tons clinker per day	Baghouse	Existing	Not Permitted
8b	**EDC613**	Penthouse storage #2 (north)	2,250 tons clinker per day	Baghouse	Existing	Not Permitted
8c	**EDC707**	Rock silo discharge	1,000 tons per hour	2001 Fuller baghouse	Proposed	Not Permitted
11	**EDC623**	Alkali bypass and alkali waste to waste bin transfer system	2,250 tons clinker per day	Baghouse	Existing	Permitted
12	**EDC731**	Finish mill #3	35 tons per hour	Baghouse	Existing	Permitted

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Attachment 11

Biodiversity Conservation Conservation Alliance & Sierra Club v.
Mountain Cement Co., Case No. 04CV 361-B
June 13, 2005

MOUNTAIN CEMENT COMPANY
CAPITAL EXPENDITURES REQUEST

CER #03-504 NAME: K2 Controls Upgrade		DATE PREPARED: 11/18/02
COMPANY NAME: Mountain Cement Co.	BUDGETED AMOUNT: $270,000	REQUESTED AMOUNT: $185,625
PRESIDENT'S APPROVAL:	PROJECT MANAGER: B.M. Bott	CORPORATE APPROVAL:

PROJECT DESCRIPTION

This automation project consists of replacing the Kiln #2 control system. The new control system is an ABB Automation, fault tolerant AC450 DCS with redundant fiber optic communications bus.

This CER represents the second phase of the controls upgrade project and consists of replacing the remaining production line control system. This includes the annunciator panel, the Foxboro Spec200 and associated Numa-logic PLC's.

Future additions to the system can include most expert control systems. The addition of the LINKman rules based controls are offered at a cost of $55,000 for each production line.

REASON FOR EXPENDITURE

The existing 20 to 30 year-old control system is costing the plant clinker production due to intermittent communication failures with remote I/O. Also, due to the limited expansion of the existing system any new projects have been implemented on K1's ABB system creating a very piece wise system that is difficult to operate and maintain. The existing configuration is lacking many basic necessities including the ease of implementing equipment interlocks.

DISCOUNT CASH FLOW

NET TOTAL CASH EXPENDITURE	$185,625
TOTAL EXPENSE SAVINGS/PROFIT CONTRIBUTION	
DISCOUNTED CASH FLOW OF SAVINGS/CONTRIBUTION	
PROJECTED RETURN ON INVESTMENT (Phase 1 & Phase 2)	3.48 years

(DETAILED WORKPAPERS MUST BE INCLUDED)

DEPRECIABLE LIFE-YEARS: 10	CODE: PI	CFO/CONTROLLER APPROVAL:	OTHER COMPANY APPROVALS:

BACKGROUND

The existing Numa-logic system is continuing to experience communication failures causing costly disturbances to the K2 process. The last 28 months have resulted in over 35 production slow downs (clinker production loss totaling 8186 tons or $317,053 for cement). Other losses include two Sumitomo inverters literally being blown up due to frequent start attempts and an increase in electrician overtime.

The Westinghouse PLC system is no longer supported and only refurbished parts are available. The company Electric South (1 of 2 companies) was handling our hardware needs and was doing many repairs incorrectly. This poor reliability with high off the shelf failures only adds to the production loss.

The existing control system is out of any type of expansion room. There are no discrete I/O remaining in the control room or in many electrical rooms. Expansion is also limited with no available Beta-Alarms and no graphic display areas. The K2 linė lacks any type of analog I/O in any electrical room. All analog instrumentation and control must be run the length of the K2 catwalk (450') to the control room Spec200. Not one current transducer, pressure transmitter or thermocouple of any kind can be added to the K2 controls. Even if a signal were run the 500' to the control room, there is no available panel space for mounting analog indicators and all pen recorders are also used. The only alarm options are audible alarms, which soon become another 'mystery' alarm at Mountain Cement.

Any new projects will be controlled by stand-alone PLC's placed through out the plant. Stand-alones are not easily installed, maintained or operated from a central area. This type of control network is not conducive to the collection of plant operating data, which offers many benefits such as Statistical Process Control or just being able to meet new federal PC MACT regulations. A recent example of system deficiency: as of June 14th, 2002 the precipitator inlet temps are reported to WYDEQ. The temperatures are reported every hour as (2) 3-hour rolling averages derived from 15 sec samples, averaged over one minute. Each calculation is triggered by Raw Mill state, Mill either being up or down. The two calculations retain all measured values at all times but only perform averaging per Raw Mill state. A daunting task when we can't even add a single thermocouple without having to run over 500' of conduit and type J/K wire. Which, when completed, continues to lack data acquisition or calculation building. Another recent installation challenge was trying to add 6 thermocouples to the precipitator inlet nozzles to help determine the gas flow stratification from Preheater fan (310F) and Raw Mill fan (147F) into the temperature dependent precipitator.

An ABB DCS currently controls the K1 production line. By implementing a similar system on K2, a well engineered, plant-wide control network can be achieved.

PROJECT PURPOSE

Replacement of the K2 and Raw Mill control systems will eliminate production loss due to Numa-logic communication fault, while delivering tremendous troubleshooting tools for both the process and its associated equipment. Other advantages include increasing the accuracy of our C_3S control, contribute to a more complete set of equipment interlocks and allow for plant expansion.

This project also allows for future expansion to a high-level control system capable of optimizing Raw Mill and Kiln production, increase fuel efficiency and improve kiln stability resulting in longer refractory life.

ALTERNATIVES & RECOMMENDATIONS (Phase 2 Cost Quotes Only)

Alternative #1: The following defines the scope of supply for Rockwell Automation:

- Supply a modern PLC 5 based control system utilizing RIO communications.
- 2 RSView HMI package to provide the operator interface with RSSql and Historian to provide data archiving and report generation.
- 5 NEMA12 I/O cabinets for the electrical rooms
- Programming of the system to meet the functional specification of the existing control system functionality
- Factory Acceptance Testing (FAT) in which the I/O cabinets will be connected together and the program loaded in a lab environment to do preliminary functional testing before the system is shipped to the site.
- On-site commissioning of the system
- Operator and Engineering training
- Hardware warranty
- One year of 24hr telephone support by qualified engineers (Support Link).

The Rockwell Automation package is offered at $266,666

Alternative #2: Install a Software PLC emulator and controls utilizing an Evergreen Control & Automation (Steeplechase) system. The savings in a soft control system will be quickly offset in training and inventory for a completely new control system. The benefits of PC based system: connectivity and openness can be matched by the proposed ABB installation.

Evergreen is not involved in engineering or commissioning of the system and consulted Behrent Engineering Company for this service. The following defines the scope of work Behrent Engineering and Evergreen Control and Automation will supply:

- Studio PC product from Entivity with license installed on 2 Windows2000 PC's
- 5 NEMA 12 I/O cabinets with electrical schematics
- Process flow diagrams
- Scope of Work documents
- Physical layout drawings
- Electrical schematics
- Panel layouts and wiring diagrams for panel fabrication
- Wire and Cable lists
- Programming for PLC's and HMI's
- Construction and commissioning support

Behrent Engineering and Evergreen's quote for this project is $420,749.

Alternative #3: Install Foxboro's fault-tolerant CP60-I/A system. The advanced process control package Connoisseur is neural net based. The following defines Foxboro proposal:

- Foxboro AW70 and WP70 installed on 2 Windows2000 PC's with 21" CRT's with printers
- AIM*Historian
- Redundant fault-tolerant CP-60 control processors
- 5 NEMA 12 I/O cabinets with redundant power supply's and fiber optic communications
- All schematics and diagrams
- Application Engineering
- Basic start-up services

The Foxboro Micro I/A package is offered at $219,558.

Alternative #4: Install Honeywell's State of the Art Control System for Cement Manufacturing. The following represents Scope of Supply:

- Provide fully assembled, state-of-the-art, microprocessor based totally integrated PlantScape Control System.
- Provide 2 PlantScape Operator Control consoles with configuration tools.
- Firmware and software to provide complete integrated and operable control system ready for configuration and graphics.
- Provide independent PlantScape system, which can be installed at different intervals to accommodated Phase I and Phase II additions.
- 5 PlantScape I/O cabinets, NEMA 1, will be distributed throughout ER1, ER4, ER5, ER6 and ER7 to terminate with existing field wiring.
- Provide PlantScape's integrated extended Event Historian.
- Provide PlantScape's integrated Report Generator with AutoReport Scheduler.
- Perform engineering and site supervision support services to effect a complete, integrated, operational and fully function control system.

The Honeywell PlantScape package is offered at $263,529.

Alternative #5, Recommendation: Install a fully redundant fiber optic ABB AC450 distributed control system. The ABB system will include Windows2000 Operator stations using standard Dell PC's. The AC450 controller is a proven robust industrial controller with fault tolerant technology.

The ABB system promotes the development of Mountain Cement equipment standards. With standardization, plant personnel can achieve proficiency.

Within the last year several projects have been commissioned on the K1 ABB system and integration with this system is crucial.

7 Additional Reasons for Recommendation:

- The AC450 has the capacity to handle entire refineries with fault tolerant control, redundant fiber communication bus and adaptive regulatory control.
- With a short commissioning time the training of plant personnel is a significant factor in a smooth migration. Production teams are familiar with the ABB controls and this will contribute greatly to the migration effort.
- The existing plant data acquisition and reporting system is more than sufficient to handle the requirements of our new control system without accruing further costs.
- Focusing on one control system significantly reduces the cost and time to train new electrical department employees.
- The new system can plug directly into the existing Masterbus and a continuous control network can be achieved without the need for extra hardware and engineering.
- ABB engineering tools (AS100 engineering station) required for process control development are presently utilized by plant staff.
- Confidence with our ABB engineer has become strong and our Electrical Teams' control system troubleshooting and programming skills are competent.

The ABB estimated installed cost $185,625.

SCOPE OF WORK

Again the control system development is a joint engineering effort between ABB and MCC. The schedule describes responsibilities for the development of the process control software.

A. Required Data from MCC:
1) P&ID's 2) I/O List, (ABB Form) 3) Process Grouping List (Sequence List- ABB Form)
4) Interlocking Sheet 5) Motor List 6) Plan for Screen Graphics Layout 7) Current ABB Control Network Layout

B. Work Breakdown

	ABB Man-Days	MCC Man-Days in Wickliffe	MCC Man-Days on site
Lead Engineer – MCC and ABB:			
1) Type Circuit Preparation and Testing	4	0	0
2) Guideline Development	1	0	1
3) Prepare Training and Train engineer/s to use TC for program development	4	0	0
4) Develop draftsperson guideline for display generation	2	0	1
5) Verify guidelines and Type Circuits before release	1	0	0
Sub-Total	**12**	**0**	**2**
Engineer – MCC and ABB:			
1) Verify I/O Lists and assign to physical I/O addresses	1	0	4
2) Program logic development using I/O lists, process grouping lists, interlocking sheets and P&ID	14	5	20
3) Simulation program development and application program tests	3	0	3
4) Factory Tests and Acceptance	10	15	0
5) Documentation	2	0	2
Sub-Total	**30**	**20**	**29**
Engineering Technician – MCC and ABB:			
1) Train draftsperson to build displays	2	0	2
2) Build displays with static and dynamic attributes (30 displays)	3	0	10
3) Verify displays with control system database	2	2	0
Sub-Total	**7**	**2**	**12**
TOTAL	**49**	**22**	**43**

The locations of the new I/O cabinets are in the existing E.R's. Due to the limited space available in E.R#1 the location of the new I/O cabinet is possibly the Spill Water E.R or E.R#1 after retro-fitting an existing Numa-logic cabinet. The Spill Water E.R. lies approximately 50' from the existing E.R.#1.

The analog signals servicing the North end, now run the length of the catwalk, will be relocated to Electrical Room #5. The analog circuits servicing the South end of the production line will be terminated in Electrical Room #1.

The I/O counts are as follows (all analog signals are located in the control room):

	AI	AO	DI (120V)	DO (120V)	
Blend PLC (ER6)					
Blend	10	5	75	30	(ER6, Cabinet A)
Kiln Feed PLC (ER4)					
Kiln Feed	10	5	75	30	(ER4, Cabinet A)
Precip	12	2	65	20	(ER4, Cabinet B)
Kiln dust handling	12	10	64	50	(ER4, Cabinet C)
Clinker Cooling PLC (ER1)					
Unlabeled	42	14	24	5	(ER1, Cabinet A)
Burn and Cool	0	0	128	32	(ER1, Cabinet B)
Coal & Clinker Handling	0	0	64	16	(ER1, Cabinet C)
Unlabeled	0	0	20	0	(ER1, Cabinet D)
Water Reclaim	4	0	8	0	(ER1, Cabinet E)
TOTAL	**90**	**36**	**523**	**183**	**832 TOTAL (Phase 2)**

Note: From the above list 15 thermocouples and 21 PID loops.

COST ESTIMATE (Phase 1 and Phase 2 Shown for Completeness)

Description	Cost	Units Req.	Unit Total	Total Cost
Raw Mill System				
ABB Automation Package	104,089		104,089	
Advant AC450 Controller		1		
S800 I/O Hardware and Cabinets		2		
NT Operator/Engineering Workstation (Single Flat Screen)		1		
NT Operator Workstation (Dual Flat Screens)		0		
Control Engineering for K2	49,000		49,000	
Time and Materials for Installation w/o Tax (Appendix B)	84,036		84,036	
Numa-logic PLC Program Translation	6,000		6,000	
Travel and Living Expenses	5,000		5,000	
Contingency 10% (ABB Hardware, Engineering, T&M)	24,813		24,813	
Tax 6% (All items except Contingency)	14,888		14,888	
				$287,826
Kiln System				
ABB Automation Package	86,911		86,911	
Advant AC450 Controller		0		
S800 I/O Hardware and Cabinets		3		
NT Operator/Engineering Workstation (Single Flat Screen)		0		
NT Operator Workstation (Dual Flat Screens)		1		
Control Engineering for K2	14,000		14,000	
Time and Materials for Installation w/o Tax (Appendix B)	48,111		48,111	
Numa-logic PLC Program Certification	6,000		6,000	
Travel and Living Expenses	5,000		5,000	
Contingency 10% (ABB Hardware, Engineering, T&M)	16,002		16,002	
Tax 6% (All items except Contingency)	9,601		9,601	
				$185,625

TOTAL $473,451

JUSTIFICATION

The existing Numa-logic system is failing to maintain communication with certain remote I/O modules. This communication error is intermittent. At times the error occurs hourly, weekly or monthly. The costs of this error are seen in lost production, electrical overtime and equipment failures. This ROI is based on the communication error that will be realized in Phase 2 of the project.

Clinker Production Lost to Communication Failure, Appendix A

Description	Tons Product (Lost)	Net Variable Profit (Lost)	
Clinker	8186		
Cement 28 months (Including Gyp & C-465)	8802	(8186 tons/.93)*($36.02)=	$317,053
Cement 12 months (Including Gyp & C-465)	3772	(((8186 tons/28)12)/.93)*($36.02)=	$135,880
Payback (yrs): $473,451/135,872 = 3.48			
$36.02	Provided By CXP		

List of Attachments

Clinker Lost to Numa-Logic Communication Fault

FY-2001 & FY-2002	Reason	Produced (tons)	K2 Ave. Prod (tons)	Loss (tons)
April 13, 2000	Communication Fault	1248		162
June 7, 2000	Communication Fault	1318		92
June 8,2000	Communication Fault	1274		136
June 19, 2000	Communication Fault	1253		157
June 20, 2000	Communication Fault	840		570
July 4, 2000	Communication Fault	387		1023
August 12, 2000	Communication Fault	1379		31
August 14, 2000	Communication Fault	1389		21
September 6, 2000	Communication Fault	1282	**1410**	128
September 15, 2000	Communication Fault	1008		402
October 2, 2000	Communication Fault	1305		105
October 25, 2000	Communication Fault	1308		102
October 26, 2000	Communication Fault	121		1289
November 16, 2000	Communication Fault	1136		274
November 25, 2000	Communication Fault	987		423
November 27, 2000	Communication Fault	1048		362
November 28, 2000	Communication Fault	1086		324
December 7, 2000	Communication Fault	831		579
December 29, 2001	Communication Fault (twice)	1236		174
January 28, 2001	Communication Fault	1400		10
January 29, 2001	Communication Fault	1264		146
February 5, 2001	Communication Fault	1366		44
September 5, 2001	Communication Fault	932		478
October 1, 2001	Communication Fault	1344		66
October 8, 2001	Communication Fault	1240		170
May 9, 2002	Field Expander, N. End	1376		34
May 16, 2002	Communication Fault	1194		216
May 17, 2002	Communication Fault	1382		28
June 30, 2002	Communication Fault	1350		60
Sept. 3, 2002	Communication Fault	1340		70
Sept. 4, 2002	Communication Fault	1330		80
Sept. 5, 2002	Communication Fault	975		435
			Total Loss	**8186**

Appendix A.1

K2 Average Production for Months during Fault (April 2000 to Sept. 2002)

Date	Unabated Daily Production	Days in Ave.
April 5, 2000	1495	1
April 15, 2000	1331	2
May 9, 2000	1391	3
May 30, 2000	1427	4
June 3, 2000	1412	5
June 23, 2000	1500	6
July 8, 2000	1465	7
September 13, 2000	1363	8
September 29, 2000	1403	9
October 4, 2000	1463	10
October 9, 2000	1440	11
November 9, 2000	1314	12
November 19, 2000	1262	13
January 18, 2001	1396	14
January 21, 2001	1404	15
February 6, 2001	1340	16
February 28, 2001	1299	17
March 3, 2001	1350	18
March 17, 2001	1365	19
March 20, 2001	1450	20
April 9, 2001	1401	21
May 25, 2001	1413	22
June 7,2001	1421	23
June 28, 2001	1445	24
July 3, 2001	1480	25
July 9, 2001	1406	26
July 19, 2001	1424	27
August 31, 2001	1345	28
September 25, 2001	1463	29
October 27, 2001	1408	30
May 18, 2002	1488	31
June 18, 2002	1444	32
July 21, 2002	1435	33
August 10, 2002	1459	34
Sept. 1, 2002	1442	35
	1410	**Average over 28 months**

Time and Materials For Phase 1 and Phase 2

Electrical Labor Kiln and Raw Mill Sys

(used $42.00/hr for labor costs)

Control Room	**Men**	**Hours**	**Ttl Hrs**	**Cost**		**Phase 1**		**Phase 2**	
Mount New I/O cabinet	3	8	24	1008		1008		0	
Identify and Relocate Analog Signals									
Label and Terminate I/O Wire									
88 I/O @ 90 min per I/O	2	66	132	5544		5544		0	
ER #5									
Mount New I/O cabinet	3	8	24	1008		1008		0	
Conduit Runs, Pull Wire (1 Cabinet)	2	8	16	672		672		0	
Label and Terminate I/O Wire									
165 I/O @ 15 min per I/O	2	21	42	1764		1764		0	
ER #7									
Mount New I/O cabinet	3	8	24	1008		1008		0	
Conduit Runs, Pull Wire (1 Cabinet)	2	8	16	672		672		0	
Label and Terminate I/O Wire									
119 I/O @ 15 min per I/O	2	15	30	1260		1260		0	
R111 Belt									
Conduit Run, Control Room to ER#7	3	80	240	10080		10080		0	
Catwalk									
Conduit Runs, Control Room to ER#4	3	80	240	10080		10080		0	
			524		**33096**		**33096**		**0**

Electrical Labor K2 System

Control Room	**Men**	**Hours**	**Ttl Hrs**	**Cost**		**Phase 1**		**Phase 2**	
Identify and Relocate Analog Signals									
Label and Terminate I/O Wire									
122 I/O @ 90 min per I/O	2	92	183	7686		0		7686	
ER #1									
Mount New I/O cabinet	3	8	24	1008		0		1008	
Conduit Runs, Pull Wire (4 Cabinets)	2	32	64	2688		0		2688	
Label and Terminate I/O Wire									
297 I/O @ 15 min per I/O	2	37	74	3108		0		3108	
ER #4									
Mount New I/O cabinet	3	8	24	1008		0		1008	
Conduit Runs, Pull Wire (2 Cabinets)	2	16	32	1344		0		1344	
Label and Terminate I/O Wire									
304 I/O @ 15 min per I/O	2	38	76	3192		0		3192	

Time and Materials

ER #6	Men	Hours	Ttl Hrs	Cost		Phase 1		Phase 2	
Mount New I/O cabinet	3	8	24	1008		0		1008	
Conduit Runs, Pull Wire (1 Cabinets)	2	8	16	672		0		672	
Label and Terminate I/O Wire									
100 I/O @ 15 min per I/O	2	13	26	1092		0		1092	
			1855		22806		0		22806

Electrical Demolition K2 Control Project

	Men	Hours	Ttl Hrs	Cost		Phase 1		Phase 2	
Demolition of Annunciator Panel	3	80		10080		0		10080	
			240		10080		0		10080

Control Room Remodeling Costs

	Rep	Hours	Unit Cst	Cost		Phase 1		Phase 2	
Desk				1500		1500		0	
Computer Cabinet				1500		1500		0	
Dry Wall				2000		0		2000	
					5000		3000		2000

System Commissioning

	Rep	Hours	Unit Cst	Cost		Phase 1		Phase 2	
ABB	2	40	125	10000		5000		5000	
LOESCHE	2	40	125	10000		10000		0	
					20000		15000		5000

Electrical Installation Materials

Description	Qty	Units	Unit Cst	Cost		Phase 1		Phase 2	
Fiber Optic Communications Cable									
ADC #FL1-K3555 NNN2-04220 Patch Panel	6		900	5400		5400		0	
Siecor #EN062A-1x3000`	8000	ft	2	12640		12640		0	
Siecor #FO031-R1ST Connectors	30	ea.	50	1500		1500		0	
Siecor #FT535-R2 Connecting Kit	1	ea.	1500	1500		1500		0	
3COM 3c16665a 6 Port Hub	2	ea.	1800	3600		3600		0	
Wire Labeling System	1	ea.	1500	1500		1500		0	
UPS 9 KVA	0	ea.	9000	0		0		0	
Conduit									
3/4"	500	ft	1	341		341		0	
1"	100	ft	1	102		102		0	
1 1/2"	2000	ft	2	3140		3140		0	
2"	100	ft	2	217		217		0	
Condulet, Hoffmans	various		3000	3000		3000		0	
Current Transformers 4-20mA	35	ea	235	8225		0		8225	
I/O Wire 36c/16awg 3200	0	ft	3	0		0		0	
					41165		32940		8225

T&M	132147	84036	48111

Bill Wilson Expert Report

Attachment 12

Biodiversity Conservation Conservation Alliance & Sierra Club v.
Mountain Cement Co., Case No. 04CV 361-B
June 13, 2005

(1)
MCC, Laramie Cement Plant Comp Ab —

MOUNTAIN
CEMENT COMPANY

5 Sand Creek Rd.
Laramie, Wyoming 82070
(307) 745-4879

December 18, 2002

Mr. Glenn Spangler
WDEQ-AQD
Herschler Building
122 West 25th Street
Cheyenne, WY 82002

Dear Mr. Spangler:

To best respond to your inquiry to item 4., **Corrective Action**, in the letter to Mountain Cement Company dated September 10, 2002; a review of the chronology of ESP maintenance and repairs would be useful. As was explained in a letter to Mr. Glenn Spangler dated August 16, 2002, the genius of the recent ESP performance issues began in December of 1999, during an annual kiln major maintenance outage, when a precipitator specialty company, John Stritikus Consulting based in Salt Lake City, was contracted to perform a major overhaul of the control device. The main thrust of the work was to improve upon past ESP performance by enhancing the precipitator's collection efficiency. This was to be accomplished in 4 of the 6 ESP fields (A/B, C, and D fields, west plus C field, east) by two primary means; optimizing the alignment between the electrical ground and the high voltage electrodes (commonly referred to as the collection plates and wires, respectively), and by improving the device's ability to clean collected material from these plates and wires thus enabling them to function continuously at the unit's optimum voltage. To achieve alignment optimization, the device's "shock bars", used to maintain optimal clearance between the collection plates and wires, and used to distribute the impact from the unit's rappers to the collection plates for cleaning, were to be replaced with new ones. However, during the replacement process it was discovered that the contractor bowed the new shock bar as they were brought into the ESP. In an effort to rectify this error, the contractor fabricated and installed an alignment rig intended to force and hold the shock bars in proper alignment. Upon kiln startup, it was immediately discovered that not only was this arrangement ineffective at maintaining sufficient clearances between the collection plates and wires, but that it also had the negative effect of partially reducing the effectiveness of the cleaning rappers. At this point, a second precipitator consulting company, TRK from Carlisle, MA, was immediately employed to troubleshoot the problem. Over the following two-week period, the TRK representative selectively removed the wires visually observed having inadequate clearances from the collection plates in all 4 modified fields until the ESP was able to operate below the 20% opacity limit under normal operating conditions. This major ESP maintenance effort and subsequent emergency, temporary fix cost approximately $220,000 as shown in Table 1 below.

Table 1: Kiln 2 ESP Repair History Summary by Year

Expenses by Category	1996	1997	1998	1999	2000	2001	2002
Contract Repair Work	$0	$55,100	$27,604	$154,836	$115,500	$134,470	$120,217
Repair Parts, Direct Charge	$35	$770	$45,566	$34,559	$2,536	$11,244	$16,883
Repair Parts from Inventory	$1,364	$4,635	$0	$31,101	$6,027	$5,291	$15,547
Total Expenditures	$1,399	$60,505	$73,170	$220,496	$124,063	$151,005	$152,647

Recognizing that the emergency fix at the direction of TRK was not a long-term solution, TRK was again brought into the plant in March of 2000 to re-inspect the ESP and develop a comprehensive repair plan with a schedule for implementation. In August of 2000, kiln 2 was again brought down for major maintenance where upon a different maintenance contractor specializing in precipitators, Whitehead Construction based in Elizabeth, TN, was employed to begin the predetermined rework under the direct supervision of a TRK representative. During this outage, the bulk of the rework encompassed removing the marginally effective alignment rig and replacing the bowed shock bars in C field, west. The balance of the work centered on realigning the collection plates to the wires in the remaining affected fields as best as possible, given the limitations of the remaining bowed shock bars with their alignment rigs. This first step in the overall repair plan was quite successful as demonstrated in the quarterly excess opacity reports that followed. As shown in Table 1, this work in 1999 cost approximately $124,000 in repair parts and contractors services.

The next phase of the ESP repair plan, scheduled to occur in June of 2001, was to re-work C field, east in the same fashion as C field, west plus other routine repairs as needed. Both Whitehead Construction and TRK were scheduled to perform the work because of the quality of workmanship provided during the previous ESP repairs. However, unrelated kiln problems forced an early kiln shutdown in May and Whitehead Construction was unable to do the work because of a prior commitment. Likewise, TRK could not supply a consultant until late in the outage. As a result, a nationally known company, Bag House Accessories (BHA) from Kansas City, MO, was brought in to perform the repairs. In all, approximately $151,000 was expensed for this work as can be seen in Table 1. To our dismay, a series of ESP mechanical breakdowns, particularly in C field, east began to randomly occur soon after startup and, in spite of our continuous efforts and corrections, continued until the next major outage in April of 2002. It was later determined that the breakdowns were the result of poor workmanship by BHA personnel and substandard welding performed previously by Stritikus Consulting. These unpredictable, random failures included multiple occurrences of the following:

- Retaining welds on ESP inlet baffle plates (used to evenly distribution the incoming gas stream) broke, causing the plates to fall into the ESP hoppers.
- The bolts used to attach C field, east collection plates to the new shock bars were found to be a quarter inch too long, thus protruding through the shock bars and short-circuiting collection voltage.
- Many of the shock bars installed in C, field east, were improperly designed, allowing the collection plates to swing in the gas stream, thus reducing collection efficiency.
- Throughout the ESP, shock bar striker plates, used to distribute the mechanical cleaning force to the collection plates, fell off from poor welds.
- Many striker plate anvils throughout the ESP were installed incorrectly resulting in poor cleaning.
- Bad welding resulted in incorrect positioning of the stop angles, impairing rapper hammer impact and creating close clearances between collecting plate baffle and wires.
- Many of the welds throughout the ESP were left with jagged edges, thus providing points for electrical arcing, reducing collection efficiency.

- All of the anti-sneak baffle at the partition wall between the east and west halves of the ESP were improperly installed, thus obstructing normal plate expansion.
- Various plate-stabilizing clips were improperly installed, allowing the collection plates to swing in the gas stream, thus reducing collection efficiency.
- Replacement electrode wires installed were of the wrong design, leading to premature failure and electrical short-circuiting.

Records indicate that during the following four-quarter period the ESP was inspected and repaired on 48 separate occasions (see Table 2) in an ongoing effort to assure compliance with opacity limits. Often, after each emergency repair, MCC was confident that the ESP would then at least perform to minimum requirements. But, because of the shear number of the deficiencies, the difficulty in identifying many of them in advance, and the continual randomness of their manifestation, the repairs often proved to be only temporary improvements, subject to the next random breakdown.

Table 2: Emergency ESP Repair Days as Indicated From Production Records

	Reporting Quarters in Question			
	2nd Qtr 2001	**3rd Qtr. 2001**	**4th Qtr. 2001**	**1st Qtr. 2002**
	April, 02	July, 06	Oct., 11	Jan., 01
ESP	April, 07	July, 24	Oct., 12	Jan., 17
	April, 23	Aug., 01	Oct., 17	Jan., 24
Maint.	May, 06	Aug., 23	Oct., 23	Jan., 28
	May, 18	Aug., 31	Nov., 01	Feb., 12
Days	May, 23	Sept., 06	Nov., 06	Feb., 20
	May. 30	Sept., 07	Nov., 23	Feb., 20
	June, 01	Sept., 14	Dec., 05	Mar., 07
	June, 14	Sept., 15	Dec., 15	Mar., 13
	June, 19	Sept., 16	Dec., 21	Mar., 22
	June, 22	Sept., 19	Dec., 22	Mar., 25
	June, 30	Sept., 28	Dec., 24	—
	—	Sept., 29	—	—
Total Days	**12**	**13**	**12**	**11**

Total All 4 Quarters = 48 Days

In April of 2002, kiln 2 was once again taken down for its annual major outage at which time, Whitehead Construction and TRK were contracted to repair the remaining damage from the previous shutdowns. The bulk of the work performed at this time included:

- All the missing gas distribution plates in the inlet nozzle were replaced, re-establishing proper gas distribution throughout the ESP.
- The remaining oversized bolts in C field, east that had not been ground down were replaced when the remaining improperly designed shock bars (several had been replaced during the previous year) were replaced.
- The improperly installed plate stabilizing clips were replaced with alignment tabs to prevent the plates from swinging in the gas stream.
- All poorly welded shock bar striker plates were rewelded.
- The remaining sharp edges from various weldments throughout the ESP were ground off.

- The wires and plates of all remaining fields were realigned.
- All striker plate anvils were properly reinstalled.
- Stop angles were removed and welded in the proper positions.
- The alignment rig and bowed shock bars in A/B fields, west were removed and new shock bars were installed.

Since starting up from this outage, kiln 2 opacity has remained well below the 5% quarterly allowable limit as reported in the last two excess opacity reports submitted to the DEQ, and continues to perform in this fashion as of this writing.

It's worth noting that in the three years prior to the December 1999 outage, MCC spent an average of $45,000 per year on ESP maintenance and managed to keep the percent of quarterly opacity exceedences under the 5% limit. It was only after spending over $200,000 in 1999 in our wholly voluntary effort to further reduce kiln 2 opacity readings did compliance issues begin. Since that time, another $428,000 has been spent to correct the ESP deficiencies resulting from the poor workmanship documented above. It is MCC's intention to spend an additional $100,000 on ESP rework during the next major kiln outage, presently scheduled in April of 2003, to finish the performance improvement project began in December of 1999.

If you need further clarification, please do not hesitate to call me.

Sincerely,

Bruce Ballinger
President
Mountain Cement Company

Bill Wilson Expert Report

Attachment 13

Biodiversity Conservation Conservation Alliance & Sierra Club v.
Mountain Cement Co., Case No. 04CV 361-B
June 13, 2005

EPA/452/B-02-001

EPA AIR POLLUTION CONTROL COST MANUAL

Sixth Edition

EPA/452/B-02-001

January 2002

United States Environmental Protection Agency
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

This sixth edition of the EPA Air Pollution Control Cost Manual was prepared by the Air Quality Strategies and Standards Division of the Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Research Triangle Park, NC 27711. Mention of trade names or commercial products is not intended to constitute endorsement or recommendation for use. Copies of this report are available through the OAQPS Clean Air Technology Center (MD-15), U.S. Environmental Protection Agency, Research Triangle Park NC 27711, or from the National Technical Information Service, 5285 Port Royal Road, Springfield VA 22161, (phone: 1-800-553-6847.)

Questions and comments should be addressed to the principal editor, Daniel C. Mussatti, OAQPS, phone 919-541-0032.

TABLE OF CONTENTS

EPA Air Pollution Control Cost Manual (Sixth Edition)

[1] New Chapter
[2] Planned Chapter

TECHNICAL REPORT DATA

(Please read Instructions on reverse before completing)

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16. ABSTRACT
In Spanish, this document provides a detailed methodology for the proper sizing and costing of numerous air pollution control devices for planning and permitting purposes. Includes costing for volatile organic compounds (VOCs); particulate matter (PM); oxides of nitrogen (NOx); SO2, SO3, and other acid gasses; and hazardous air pollutants (HAPs).

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Economics Cost Engineering cost Sizing Estimation Design	Air Pollution control Incinerators Absorbers Adsorbers Filters Condensers Electrostatic Precipitators Scrubbers	

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EPA/452/B-02-001

Section 6

Particulate Matter Controls

EPA/452/B-02-001

Chapter 1

Baghouses and Filters

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December 1998

1.5 Estimating Total Annual Costs

1.5.1 Direct Annual Cost

Direct annual costs include operating and supervisory labor, operating materials, replacement bags, maintenance (labor and materials), utilities, and dust disposal. Most of these costs are discussed individually below. They vary with location and time, and, for this reason, should be obtained to suit the specific baghouse system being costed. For example, current labor rates may be found in such publications as the Monthly Labor Review, published by the U.S. Department of Labor, Bureau of Labor Statistics (BLS), or obtained from the BLS web site at: *http://stats.bls.gov.*

1.5.1.1 Operating and Supervisory Labor

Typical operating labor requirements are 2 to 4 hours per shift for a wide range of filter sizes.[26] When fabric filters are operated to meet Maximum Achievable Control Technology (MACT) regulations, it is likely that the upper end of the range is appropriate. Small or well-performing units may require less time, while very large or troublesome units may require more. Supervisory labor is taken as 15% of operating labor.

1.5.1.2 Operating Materials

Operating materials are generally not required for baghouses. An exception is the use of precoat materials injected on the inlet side of the baghouse to provide a protective dust layer on the bags when sticky or corrosive particles might harm them. Adsorbents may be similarly injected when the baghouse is used for simultaneous particle and gas removal. Costs for these materials should be included on a dollars-per-mass basis (e.g., dollars per ton).

1.5.1.3 Maintenance

Maintenance labor varies from 1 to 2 hours per shift.[26] As with operating labor, these values may be reduced or exceeded depending on the size and operating difficulty of a particular unit. The upper end of the range may be required for operation to meet MACT regulations. Maintenance materials costs are assumed to be equal to maintenance labor costs.[26]

Table 1.9 Capital Cost Factors for Fabric Filters[a]

Cost Item	Factor
<u>Direct costs</u>	
Purchased equipment costs	
Fabric filter (EC) + bags + auxiliary equipment	As estimated, A
Instrumentation	0.10 A
Sales taxes	0.03 A
Freight	0.05 A
Purchased Equipment Cost, PEC	B = 1.18 A
Direct installation costs	
Foundations & supports	0.04 B
Handling & erection	0.50 B
Electrical	0.08 B
Piping	0.01 B
Insulation for ductwork[b]	0.07 B
Painting[c]	0.04 B
Direct installation cost	0.74 B
Site preparation	As required, SP
Buildings	As required, Bldg.
Total Direct Cost	**1.74 B + SP + Bldg.**
<u>**Indirect Costs (installation)**</u>	
Engineering	0.10 B
Construction and field expense	0.20 B
Contractor fees	0.10 B
Start-up	0.01 B
Performance test	0.01 B
Contingencies	0.03 B
Total Indirect Cost, IC	**0.45 B**
Total Capital Investment = DC + IC	**2.19 B + SP + Bldg.**

[a]Reference [29], revised
[b]Ductwork and stack costs, including insulation costs, may be obtained from Chapter 10 of the manual. This installation factor pertains solely to insulation for fan housings and other auxiliaries, except for ductwork and stacks.
[c]The increased use of special coatings may increase this factor to 0.06B or higher. [The factors given in Table 1.8 are for average installation conditions. Considerable variation may be seen with other-than-average installation circumstances.]

1.5.1.4 Replacement Parts

Replacement parts consist of filter bags, which have a typical operating life of about 2 to 4 years. The following formula is used for computing the bag replacement cost:

$$CRC_B = \left(C_B + C_L\right) \times CRF_B \tag{1.13}$$

where

CRC_B	=	bag capital recovery cost ($/year)
C_B	=	initial bag cost including taxes and freight ($)
C_L	=	bag replacement labor ($)
CRF_B	=	capital recovery factor (defined in Chapter 2) whose value is a function of the annual interest rate and the useful life of the bags (For instance, for a 7% interest rate and a 2-year life, $CRF_B = 0.5531$.)

Bag replacement labor cost (C_L) depends on the number, size, and type of bags; their accessibility; how they are connected to the baghouse tube-sheet; and other site-specific factors that increase or decrease the quantity of labor required. For example, a reverse-air baghouse probably requires from 10 to 20 person-minutes to change an 8-inch by 24-foot bag that is clamped in place. Based on a filtering surface area of approximately 50 ft^2 and a labor rate of $29.15/h (including overhead), C_L would be $0.10 to $0.19/ft^2 of bag area. As Table 1.8 shows, for some bags (e.g., polyester), this range of C_L would constitute a significant fraction of the purchased cost. For pulse jets, replacement time would be about 5 to 10 person-minutes for a 5-inch by 10-foot bag in a top-access baghouse, or $0.19 to $0.37/ft^2 of bag area. This greater cost is partially offset by having less cloth in the baghouse, but there may be more of the smaller bags. These bag replacement times are based on changing a minimum of an entire module and on having typical baghouse designs. Times would be significantly longer if only a few bags were being replaced or if the design for bag attachment or access were atypical. Cartridge baghouses with horizontal mounting take about 4 minutes to change one cartridge. Older style baghouses with vertical mounting and blow pipes across the cartridges take about 20 min/cartridge.

The Manual methodology treats bags and bag replacement labor as an investment amortized over the useful life of the bags, while the rest of the control system is amortized over its useful life, typically 20 years (see Subsection 1.5.2). Capital recovery factor values for bags with different useful lives can be calculated based on the method presented in Section 1.

1.5.1.5 Electricity

Electricity is required to operate system fans and cleaning equipment. Primary gas fan power can be calculated as described in Chapter 2 of Section 2 and assuming a combined fan-motor efficiency of 0.65 and a specific gravity of 1.000. We obtain:[27]

$$Power_{fan} = 0.000181\ Q(\Delta P)\theta \tag{1.14}$$

where

$Power_{fan}$	=	fan power requirement (kWh/yr)
Q	=	system flow rate (acfm)
ΔP	=	system pressure drop (in. H_2O)
θ	=	operating time (h/yr)

Cleaning energy for reverse-air systems can be calculated (using equation 1.14) from the number of compartments to be cleaned at one time (usually one, sometimes two), and the reverse gas-to-cloth ratio (from about one to two times the forward gas-to-cloth ratio). Reverse-air pressure drop varies up to 6 or 7 in. H_2O depending on location of the fan pickup (before or after the main system fan).[28] The reverse-air fan generally runs continuously.

Typical energy consumption in kWh/yr for a shaker system operated 8,760 h/yr can be calculated from:[5]

$$P = 0.053\ A \tag{1.15}$$

where

A	=	gross fabric area (ft^2)

1.5.1.6 Fuel

Fuel costs must be calculated if the baghouse or associated ductwork is heated to prevent condensation. These costs can be significant, but may be difficult to predict. For methods of calculating heat transfer requirements, see Perry.[29]

1.5.1.7 Water

Cooling process gases to acceptable temperatures for fabrics being used can be done by dilution with air, evaporation with water, or heat exchange with normal equipment. Evaporation and normal heat exchange equipment require consumption of plant water, although costs are not usually significant. Chapter 1 of Section 3.1, Adsorbers, provides information on estimating cooling-water costs.

1.5.1.8 Compressed Air

Pulse-jet filters use compressed air at pressures from about 60 to 100 psig. Typical consumption is about 2 scfm/1,000 cfm of gas filtered.[5] For example, a unit filtering 20,000 cfm of gas uses about 40 scfm of compressed air for each minute the filter is operated. For each pulse, cartridge filters with nonwoven fabrics use 10 scfm/1,000 ft^2 or 14 scfm/1,000 ft^2 at 60 psig or 90 psig pulse pressure, respectively, in one manufacturer's design.[30] When using paper media, the air quantities are 1.7 scfm/1,000 ft^2 and 2.2 scfm/1,000 ft^2 at the respective pressures. Pulse frequency ranges from about 5 min. to 15 min. A typical cost for compressed air is $0.25/1,000 scf in 1998 dollars.

1.5.1.9 Dust Disposal

If collected dust cannot be recycled or sold, it must be landfilled or disposed of in some other manner. Disposal costs are site-specific, but typically run $35 to $55 per ton at municipal waste sites in Pennsylvania, exclusive of transportation (see Section 1). Lower costs may be available for industrial operations with long-term disposal contracts. Hazardous waste disposal can cost $150 per ton or more.

1.5.2 Indirect Annual Cost

Indirect annual costs include capital recovery, property taxes, insurance, administrative costs ("G&A"), and overhead. The capital recovery cost is based on the equipment lifetime and the annual interest rate employed. (See Section 1 for a discussion of the capital recovery cost and the variables that determine it.) For fabric filters, the system lifetime varies from 5 to 40 years, with 20 years being typical.[26] However, this does not apply to the bags, which usually have much shorter lives. Therefore, one should base system capital recovery cost estimates on the installed capital cost, less the cost of replacing the bags (*i.e.*, the purchased cost of the bags plus the cost of labor necessary to replace them). Algebraically:

$$CRC_s = \left[TCI - C_B - C_L\right]CRF_s \qquad (1.16)$$

where

CRC_s	=	capital recovery cost for fabric filter system ($/yr)
TCI	=	total capital investment ($)
C_B	=	initial cost of bags *including* taxes and freight ($)[4]
C_L	=	labor cost for replacing bags ($)
CRF_s	=	capital recovery factor for fabric filter system (defined in Chapter 2).

For example, for a 20-year system life and a 7% annual interest rate, the CRF_s would be 0.09439.

The suggested factor to use for property taxes, insurance, and administrative charges is 4% of the *TCI* (see Section 1). Finally, overhead is calculated as 60% of the total labor (operating, supervisory, and maintenance) and maintenance materials.

1.5.3 Recovery Credits

For processes that can reuse the dust collected in the baghouse or that can sell the dust (e.g., fly ash sold as an extender for paving mixes), a recovery credit (*RC*) should be taken. As used in equation 1.17, this credit (*RC*) is subtracted from the *TAC*.

1.5.4 Total Annual Cost

Total annual cost for owning and operating a fabric filter system is the sum of the components listed in Sections 1.5.1 through 1.5.3:

$$TAC = DC + IC - RC \qquad (1.17)$$

where

TAC	=	total annual cost ($)
DC	=	direct annual cost ($)
IC	=	indirect annual cost ($)
RC	=	recovery credits (annual) ($)

1.6 Example Problem

Assume a baghouse is required for controlling fly ash emissions from a coal-fired boiler. The flue gas stream is 50,000 acfm at 325 °F and has an ash loading of 4 gr/acf. Analysis of the ash shows a mass median diameter of 7 μm. Assume the baghouse operates for 8,640 h/yr (360 d).

[4]Typically, 8% of the bag initial cost.

The gas-to-cloth ratio (*G/C*) can be taken from Table 1.1 as 2.5, for woven fabrics in shaker or reverse-air baghouses, or 5, for felts used in pulse-jet baghouses. If a factor method were used for estimating *G/C*, Table 1.3 for shakers would yield the following values: $A = 2$, $B = 0.9$, and $C = 1.0$. The gas-to-cloth ratio would be:

$$2 \times 0.9 \times 1.0 = 1.8.$$

This value could also be used for reverse-air cleaning. For a pulse-jet unit, Table 1.4 gives a value of 9.0 for factor A and 0.8 for factor B. Equation 1.11 becomes:

$$\begin{aligned} V &= 2.878 \times 9.0 \times 0.8(275)^{-0.2335}(4)^{-0.06021}(0.7471 + 0.0853 \ \ln \ 7) \\ &= 4.69 \end{aligned}$$

Because this value is so much greater than the shaker/reverse-air *G/C*, we conclude that the pulse-jet baghouse would be the least costly design. This conclusion is based on the inference that a much bigger *G/C* would yield lower capital and, in turn, annual costs. However, to make a more rigorous selection, we would need to calculate and compare the total annual costs of all three baghouse designs (assuming all three are technically acceptable). The reader is invited to make this comparison. Further discussion of the effects of *G/C* increases, and accompanying pressure drop increases, on overall annual costs will be found in Reference 30.[5] Assume the use of on-line cleaning in a common housing structure and, due to the high operating temperature, the use of glass filter bags (see Table 1.6).[6] At a gas-to-cloth ratio of 4.69, the fabric required is[7]

$$50{,}000 \text{ acfm}/4.69 \text{ fpm} = 10{,}661 \text{ ft}^2.$$

From Figure 1.8, the cost of the baghouse ("common housing" design) is:

$$Cost = 2{,}307 + 7.163(10{,}661) = \$78{,}672$$

[5]In addition, the CO$T-AIR control cost spreadsheet for fabric filters computes capital and annual costs for all three designs. Download CO$T-AIR at: *http://www.epa.gov/ttn/catc/products.html#ccc.info*.

[6]As Table 1.6 shows, other bag materials (e.g., Nomex) also could withstand this operating temperature. But Fiberglas is the least expensive on a purchased cost basis. For harsh environments, a more expensive, but more durable bag might cost less on a total annual cost basis.

[7]This is the total (gross) bag area required. No bag adjustment factor has been applied here, because this is a common housing pulse jet unit that is cleaned continuously during operation. Thus, no extra bag compartment is needed, and the gross and net bag areas are equal.

Insulation is required. The insulation add-on cost from Figure 1.8 is:

$$Cost = 1{,}041 + 2.23(10{,}661) = \$24{,}815$$

From Table 1.8, bag costs are \$1.69/ft² for 5-1/8-inch diameter glass fiber, bottom removal bags. Total bag cost is

$$10{,}661\ ft^2 \times \$1.69/ft^2 = \$18{,}017.$$

For 10 ft long cages,

$$fabric\ area\ per\ cage = \frac{\left(5\tfrac{1}{8}\,in\right)}{\left(12\,\tfrac{in}{ft}\right)} \times \pi \times 10\,ft = 13.42\,ft^2$$

$$the\ number\ of\ cages = \frac{\left(10{,}661\,ft^2\right)}{\left(13.42\,ft^2\right)}$$

$$= 795\ \ cages\ \left(rounded\ up\ to\ the\ next\ integer\right)$$

From Table 1.7, individual cage cost is

$$2.5212 \times 13.42\ ft^{2(0.5686)} = \$11.037.$$

Total cage cost is

$$795\ cages \times \$11.037/cage = \$8{,}774.$$

Assume the following auxiliary costs have been estimated from data in other parts of the Manual:

Ductwork	$19,000
Fan	19,000
Motor	12,000
Starter	4,700
Dampers	9,800
Compressor	8,000
Screw conveyor	5,000
Stack	12,000
Total	**$89,500**

Direct costs for the fabric filter system, based on the factors in Table 1.9, are given in Table 1.10. (Again, we assume site preparation and buildings costs to be negligible.) Total capital investment is $569,000. Table 1.11 gives the direct and indirect annual costs, as calculated from the factors given in Section 1.5.1. For bag replacement labor, assume 10 min per bag for each of the 795 bags. At a maintenance labor rate of $29.65 (including overhead), the labor cost is $3,943 for 133 h. The bags and cages are assumed to be replaced every 2 yr. The replacement cost is calculated using Equation 1.13.

Pressure drop (for energy costs) can be calculated from Equations 1.8 and 1.9, with the following assumed values:

$$K_2 = 15\frac{\frac{in\ \mathrm{H_2O}}{1(ft/min)}}{\frac{lb}{ft^2}}$$

$$P_j = 100\ \ psig$$

$$cleaning\ interval = 10\ min$$

We further assume that a *G/C* of 4.69 ft/min is a good estimate of the mean face velocity over the duration of the filtering cycle.

$$W_o = C_i V\theta$$

$$= 4\frac{gr}{ft^3} \times \frac{1 lb}{7{,}000 gr} \times 4.69\frac{ft}{min} \times 10 min$$

$$= 0.0268\frac{lb}{ft^2}$$

$$\Delta P = 6.08 \times 4.69\frac{ft}{min} \times (100 \ \ psig)^{-0.65}$$

$$+ 15\frac{\frac{in H_2O}{ft/min}}{lb/ft^2} \times 0.0268\frac{lb}{ft^2} \times 4.69\frac{ft}{min}$$

$$= 3.32 \ \ in \ \ H_2O \text{ across the fabric (when fully loaded).}$$

Assume that the baghouse structure and the ductwork contribute an additional 3 in. H_2O and 4 in. H_2O, respectively. The total pressure drop is, therefore, 10.3 inches.

The total annual cost is $474,000, 39 percent of which is for ash disposal. If a market for the fly ash could be found, the total annual cost would be greatly reduced. For example, if $2/ton were received for the ash, the total annual cost would drop to $274,000 ($474,000 – $185,000 – $14,800), or 58% of the cost when no market exists. Clearly, the total annual cost is extremely sensitive to the value chosen for the dust disposal cost in this case. In this and in similar cases, this value should be selected with care.

Table 1.10 Capital Costs for Fabric Filter System Example Problem (2^{nd} quarter 1998 $)

Cost Item	Cost
Direct Costs	
Purchased equipment costs	
Fabric filter (with insulation)(EC)	$103,847
Bags and cages	26,791
Auxiliary equipment	89,500
Sum = A	$220,138
Instrumentation, 0.1A	22,014
Sales taxes, 0.03A	6,604
Freight, 0.05A	11,007
Purchased equipment cost, B	$259,763
Direct installation costs	
Foundation and supports, 0.04B	10,391
Handling and erection, 0.50B	129,882
Electrical, 0.08B	20,781
Piping, 0.01B	2,598
Insulation for ductwork, 0.07B	18,183
Painting, 0.04B	10,391
Direct installation cost	192,226
Site preparation	-
Facilities and buildings	-
Total Direct Cost	**$451,989**
Indirect Costs (installation)	
Engineering, 0.10B	25,976
Construction and field expenses, 0.20B	51,953
Contractor fees, 0.10B	25,976
Start-up, 0.01B	2,598
Performance test, 0.01B	2,598
Contingencies, 0.03B	7,793
Total Indirect Cost	**$116,894**
Total Capital Investment (rounded)	**$569,000**

Table 1.11 Annual Costs for Fabric Filter System Example Problem (2nd quarter 1998 $)

Cost Item	Calculations	Cost
Direct Annual Costs, DC		
Operating labor		
Operator	$\frac{2\ h}{shift} \times \frac{3\ shifts}{day} \times \frac{360\ days}{yr} \times \frac{\$17.26}{h}$	$37,282
Supervisor	15% of operator = 0.15 x 37,282	5,592
Operating materials		—
Maintenance		
Labor	$\frac{1\ h}{shift} \times \frac{3\ shifts}{day} \times \frac{360\ days}{yr} \times \frac{\$17.74}{h}$	19,159
Material	100% of maintenance labor	19,159
Replacement parts, bags	[3,943 + (26,791 x 1.08[a])] x 0.5531	18,184
Utilities		
Electricity	$0.000181 \times 50{,}000\ acfm \times 10.3\ in\ H_2O \times \frac{8{,}640\ h}{yr} \times \frac{\$0.0671}{kWh}$	54,041
Compressed air (dried and filtered)	$\frac{2\ scfm}{1{,}000\ acfm} \times 50{,}000\ acfm \times \frac{\$0.25}{1{,}000\ scf} \times \frac{60\ min}{h} \times \frac{\$8{,}640\ h}{yr}$	12,960
Waste disposal	at $25/ton on-site for essentially 100% collection $\frac{4\ gr}{ft^3} \times \frac{1\ lb}{7{,}000\ gr} \times 50{,}000\ ft^3 \times \frac{60\ min}{h} \times \frac{8{,}640\ h}{yr} \times \frac{1\ ton}{2{,}000\ lb} \times \frac{\$25}{ton}$	185,134
Total DC	(rounded)	**351,500**
Indirect Annual Costs, IC		
Overhead	60% of sum of operating, supv., & maint. labor & maint. materials = 0.6(37,282+5,592+19,159+19,159)	48,715
Administrative charges	2% of Total Capital Investment = 0.02 ($568,883)	11,378
Property Tax	1% of Total Capital Investment = 0.01 ($568,883)	5,689
Insurance	1% of Total Capital Investment = 0.01 ($568,883)	5,689
Capital recovery[b]	0.09439 (568,883- 3,943 - 28,934 x 1.08)	50,594
Total IC (rounded)		**122,100**
Total Annual Cost	**(rounded)**	**$474,000**

[a]The 1.08 factor is for freight and sales taxes.

[b]The capital recovery cost factor, CRF, is a function of the fabric filter or equipment life and the opportunity cost of the capital (*i.e.*, interest rate). For example, for a 20-year equipment life and a 7% interest rate, CRF = 0.09439.

Bill Wilson Expert Report

Attachment 14

Biodiversity Conservation Conservation Alliance & Sierra Club v.
Mountain Cement Co., Case No. 04CV 361-B
June 13, 2005

BILL WILSON, P.E.

7247 Brennans Drive
Dallas, Texas 75214

Phone # 214.887.9412
eMail: bec4@swbell.net

QUALIFICATIONS AND BACKGROUND

Registered professional engineer in Texas (#69028) with 20 years of environmental engineering experience and increasing responsibility for:

Project Management   Data Analysis   Problem solving   Information systems

PROFESSIONAL EXPERIENCE

Consulting Environmental Engineer **Since 6/04**
Offering services to organizations in need of assistance with litigation, training, permitting, compliance, recordkeeping, or reporting.

Air Quality Engineer
American Electric Power **1/99 to 5/04**
Responsibility for compliance with state and federal regulations that apply to air emissions from seven electric power plants in East Texas and Northern Louisiana including permitting, record keeping, reporting, and training for Title V, New Source Review, and PSD.

Manager of Industrial Compliance
ATC Associates **6/98 to 8/98**
Market environmental consulting services to potential industrial clients.

Environmental Manager
North Texas Cement Company **8/93 to 5/98**
Managed all environmental projects at Portland cement plant including: remedial investigation, air permitting, storm water, wastewater, CKD landfill design and management, lobbyist for Scrap Tire Legislation, and managed scrap tire procurement program. Managed PSD application process for green field cement plant north of Dallas. Managed Title V application process for Portland cement plant in Midlothian, Texas. Two years experience in safety program management.

Consulting Engineer
Cook-Joyce Consulting Engineers **3/92 to 7/93**
Project Manager for site assessments for lead contaminated sites (NL Industries). Project Manager for hazardous waste removal, treatment, and decontamination at multiple sites in the Houston Area (AT&T).

Staff Engineer
Texas Water Commission (now TCEQ) **7/91 to 2/92**
RCRA permit writer for commercial hazardous waste treatment, storage, and disposal facilities. Member of the Risk Reduction Workgroup writing the original Texas Risk Reduction Rules. Conducted RCRA Facility Assessments, drafted RCRA permits, gave expert witness testimony, delivered presentations, mediated disputes.

Consulting Engineer
PRC Environmental, Inc. **3/91 to 6/91**
Conducted research of files at the U. S. Environmental Protection Agency, Region 6 headquarters and prepared summary reports.

Hydrologist II
Texas Water Commission (now TCEQ) **11/85 to 3/91**
Conducted engineering analysis of applications, plans, and specifications for creation of Municipal Utility Districts and the issuance of bonds to install utilities to support the MUD (2 years). RCRA permit writer for commercial hazardous waste treatment, storage, and disposal facilities. Member of the Risk Reduction Workgroup writing the original Texas Risk Reduction Rules. Conducted RCRA Facility Assessments, drafted RCRA permits, gave expert witness testimony, delivered presentations, mediated disputes. (3 years)

Assistant Geologist
Railroad Commission of Texas **5/85 to 11/85**
Conducted engineering and geological analysis of applications for surface disposal of oil field waste.

EDUCATION

Master of Science in Environmental Engineering	University of Texas at Austin (1991)
Bachelor of Engineering Science	University of Texas at Austin (1985)
Bachelor of Business Administration	University of Texas at Austin (1976)

UNITED STATES DISTRICT COURT
DISTRICT OF WYOMING

BIODIVERSITY CONSERVATION ALLIANCE and SIERRA CLUB,	)	
Plaintiffs,	)	
v.	)	Case No. 04CV 361-B
MOUNTAIN CEMENT COMPANY,	)	
Defendant.	)	

CERTIFICATE OF SERVICE: Plaintiffs' Expert Reports

I HEREBY CERTIFY that on the 13TH day of June, 2005, on behalf of the plaintiffs, I caused to be hand delivered to Mr. Nicholas, and mailed to Mr. Harris, the expert reports of Bill Wilson and Jonathan Shefftz at the following addresses:

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Anthony, Nicholas et al.
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Laramie, WY 82073

James Harris
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1700 Pacific, Suite 3300
Dallas, TX 75201

Reed Zars
Reed Zars